



DIESEL MACHINE MONITOR



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USER MANUAL

E09819 ISSUE 2 19/10/06

Dieselguard_Manual_Issue_2_E09819_191006

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Before You Begin

We would like to thank you for purchasing the Ampcontrol Dieselguard and Gasguard Products. To become completely familiar with this equipment and to ensure correct operation, we recommend that you take the time to read this user manual thoroughly.

IMPORTANT WARNINGS AND ADVICE

This equipment has been designed to control the signals from equipment that detects hazardous gases and vapours and to provide warning and control signals before dangerous conditions are reached. In order to ensure that the equipment will warn of dangerous situations it is essential that the instructions in this manual and those of the associated items be read, understood and followed. It is further stressed that the effectiveness of the control system depends heavily on the user who is responsible for its correct installation, application, use and regular maintenance.

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SECTION 1 – DESCRIPTION

1.1 Introduction

This manual provides installation, commissioning, operation and maintenance instructions for the Ampcontrol Dieselguard Control Units.

The Dieselguard Control Unit consists of two types:

- **Blind type**

Preset configuration without data logging or communications.

- **Smart type**

With communications link that permits on site configuration and logging of data.

Part Numbers

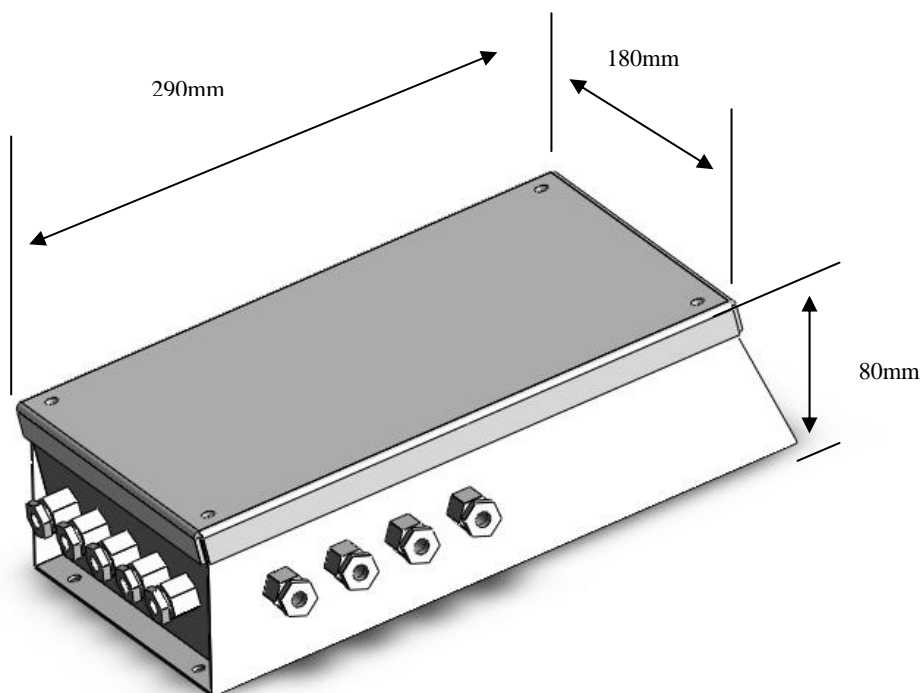
The following Dieselguard Control Units are covered in this manual.

E09464 Dieselguard Controller Basic

E09481 Dieselguard Base Station RF Receiver

E09484 Dieselguard Controller, Radio Version

Dieselguard Control Unit Dimensions



1.2 Dieselguard Description

The Ampcontrol Dieselguard Machine Monitor forms part of the Diesel Machine monitoring system. The Diesel Machine Monitor is the centre of the system and comprises a Stainless Steel IP 66 low profile enclosure fitted with encapsulated electronics and IS terminations to external sensors and displays.

The Diesel Machine Monitor is an Exm ia certified product that is powered from the alternator supply of the vehicle. Apart from the supply power all other connections to the Dieselguard Control unit are Ex ia Intrinsically Safe (IS) circuits.

In operation, the Dieselguard system monitors ambient gas levels (methane for the standard installation) and provides indication and control based on the measured gas levels. The system prevents unsafe starting of a machine in the presence of dangerous levels of explosive gas. Similarly, if a machine is running, the Dieselguard system will shut the machine down if surrounding gas levels rise above the set alarm point. This prevents continuing unsafe operation of a machine in a potentially dangerous atmosphere.

The Diesel Machine Monitor provides the control via a solenoid valve incorporated into the diesel machine's safety pressure circuit. When released the solenoid allows the system to de-pressurise and as a result, shut down the machine

Input power is provided via the integral encapsulated cable and is non-polarity sensitive. The input circuitry has been designed to withstand a wide variety of 'dirty' power supply types. Many alternators provide power that has a high level of ripple and high voltage noise spikes. The Dieselguard Diesel Machine Monitor is designed to withstand these conditions without operational problems. The unit will withstand a 90V repetitive overload condition via its internal auto-reset protection barrier. The input power supply circuitry is galvanically isolated from the rest of the system.

The unit is designed as a component approved device and can be used with Intrinsically Safe and "simple apparatus" accessories such as Gas transmitters, RTD's, Pressure and level switches, LED indicators, Solenoid valves and Intrinsically Safe display systems.

The Dieselguard Machine Monitor is housed in an IP 66 enclosure which once fitted to the machine does not need to be accessed.

The system can be supplied as a basic "Blind" gas detection and alarm control unit to shut down the fuel supply on diesel machines or as a "Smart" machine monitoring and data acquisition system.

The Diesel Machine Monitor is pre-configured to detect Methane gas around the vehicle and to provide a normally energised solenoid supply which will de-energise and hence de-pressurise the vehicle safety loop (diesel supply valve) in event of high gas readings.

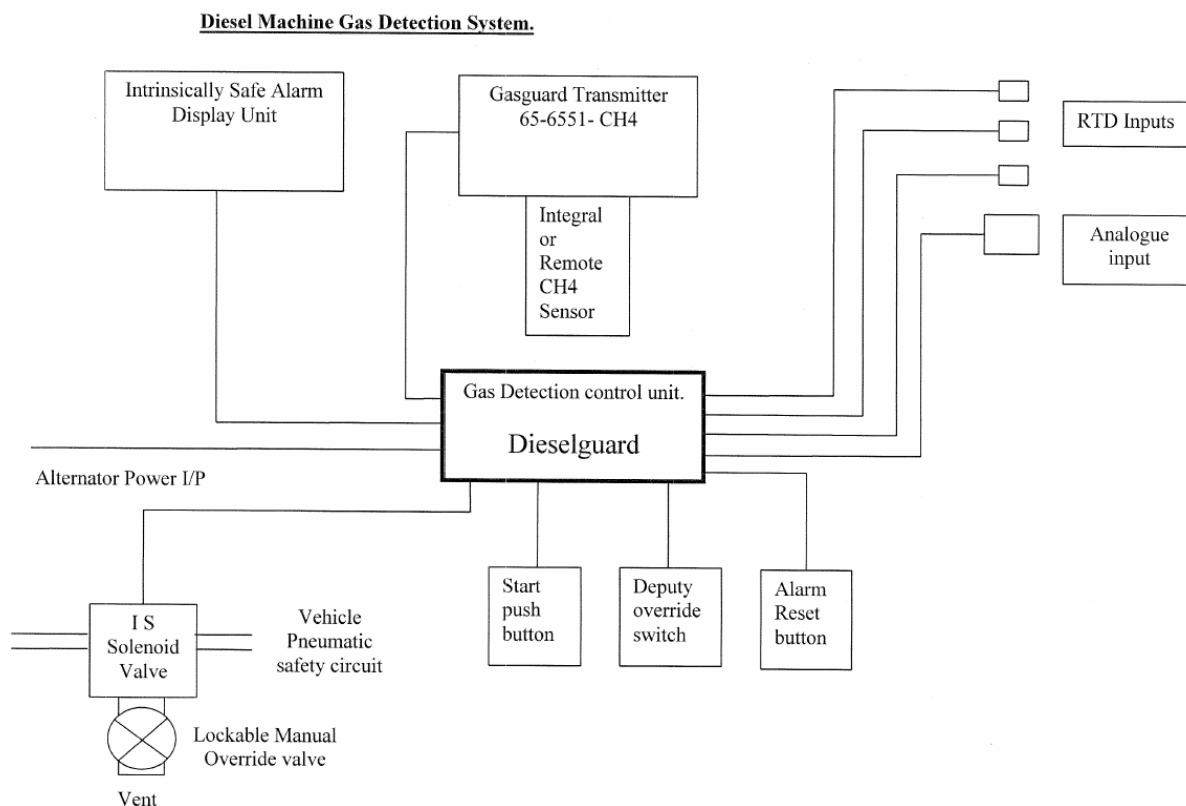
The Basic unit is a 'Blind' control system whose operation is factory set during manufacture. This model does not include the radio link or data logging function. It is preset as a Gas Monitor and control unit to provide a warning signal at 1.00% and trip function by de-energising the solenoid at 1.25% CH₄.

Models with "Smart" Monitoring are used with the wireless base station to configure alarm trip points, provide real time status information and download logged data.

The Diesel Machine Monitor is designed not to need regular maintenance or access. The only replaceable item is the internal battery which will require changing after 3 to 5 years.

1.3 Typical Application

The Dieselguard Machine Monitor receives signals from an external device such as a Gas Transmitter and provides outputs to give indications and control. A typical scheme of a system is shown below.



1.4 Connections

Dieselguard Inputs:

Power supply

The Diesel Machine Monitor can be powered from a nominal 12-24V supply. The Intrinsically Safe features of the unit require it to be capable of standing the fault conditions of a vehicle alternator including back EMF from equipment isolation. The unit is designed to operate on an AC/DC supply of 9.5 - 36V but will withstand 90V. The input to the Diesel Machine Monitor is isolated from the enclosure for use with non earthed alternator systems.

Start input

Is a momentary switch contact to start the system. This switch should be normally open and close to 0V.

Reset alarm input

Is a momentary switch contact to reset alarms. This switch should be normally open and close to 0V.

Alarm output override input

Latched or locking contact to turn on the output drive. This switch input directly overrides the alarm state of the controller, allowing the machine to be started following or during a high alarm condition.

Temperature sensor inputs (3 RTD Inputs)

Two inputs (RTD 2 and 3) are simple 2-wire connections. Connection for each sensor is between 'drive' and 0V

RTD 1 input is a 4-wire connection. 'RTD1 drive' and 'RTD1 hi' connect to one end of the RTD (at the sensor). 'RTD1 return' and 'RTD1 low' connect to the other end of the RTD (at the sensor). The RTD values can be logged on the Smart version of the controller but are not used on the Basic unit.

Gas Sensor input.

Is a 4-20mA signal sinking to 0V inside the Diesel Machine Monitor. Fault detection on sensor connection open or shorted.

Dieselguard Outputs:

Gas Sensor Supply

12V DC output at up to 160mA (220mA max short circuit limit)

Alarm indicator drives (IDA Red and IDA Green)

Alarm output drives at 12V DC 30mA. One for each alarm level.

Aux Output

Auxiliary output for displays and alarms. 12VDC 160mA (220mA max short circuit limit)

4-20mA Output

4-20mA output proportional to gas level. Common 0V to Dieselguard system.

Solenoid Drive output

Solenoid output NE 24V DC 84mA. Off in alarm state.

1.4.1 Connection Terminals

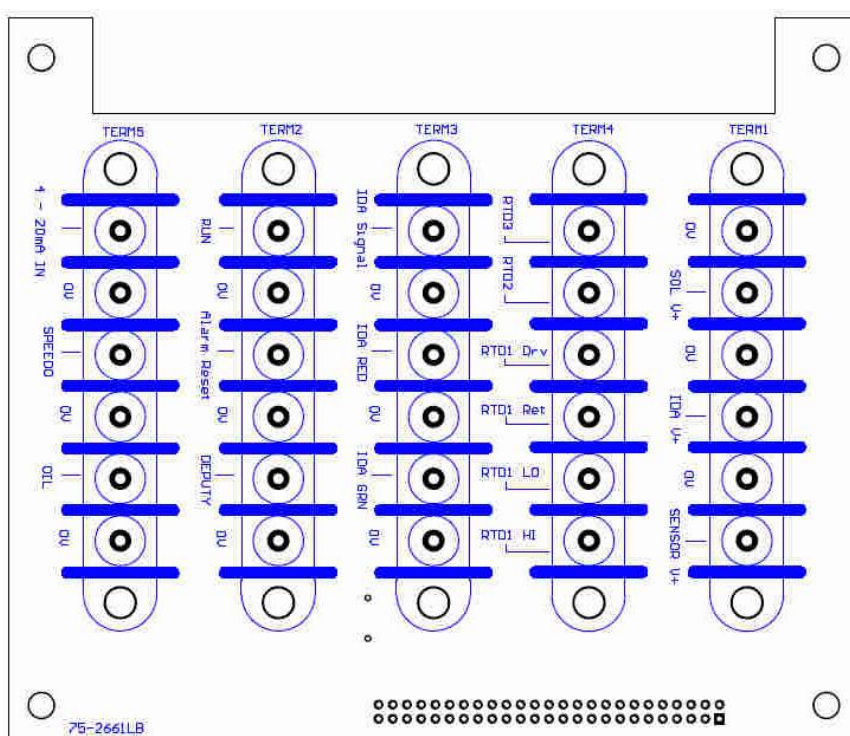
The electronics of the Diesel Machine Monitor are fully encapsulated. Inside the enclosure the only accessible connections are IS circuits. The Intrinsically Safe Parameters are shown on page 4 and 5 of the Certificate of conformity. A detail of the connection panel is shown below.

The power supply connection is via a type 2s cable encapsulated into the electronics of the enclosure. The cable should be connected to the vehicle alternator system in a suitably rated enclosure.

NOTE: When installing connections to the 'run' button, please install a link between the 'run' terminal and the 'speedo' connection. If no connection is made between these two terminals, the system will not wake when the run button is pressed. (Non battery cut off versions only. See fault finding)

Manual / Auto Reset modes:

If a wire link is permanently installed between 'reset' and 0V, then at power up the unit will be set to 'auto-reset' mode. This enables the unit to come out of alarm automatically once the gas levels have fallen below alarm 1 level (1% by volume). If no link is installed, then the unit is set to manual reset. This mode requires a manually operated reset button to clear the alarm state.



1.5 Dieselguard Diesel Machine Monitor Specifications

Power to the DMCS is provided by connection to the diesel machine's alternator. The supply input has the following specification.

Voltage input range:	9.5 VDC min to 36 VDC max.
Input current at full load:	1.4A
Supply ripple tolerance:	Will operate within the min/max limits.
Maximum voltage overload:	90V for 100mS. No stress
Certified input voltage Um:	90V
Overvoltage protection concept:	Tripllicated barrier with transient suppression and auto-reset. Circuits beyond the barrier are limited to 16.2V maximum overload.
Input Supply Filtering:	Common mode DC choke.
Input transient suppression:	Metal Oxide Varistor (MOV)
Input Reverse supply protection:	Diode.
Alternator Drop out tolerance:	During drop-outs the system will fall onto internal battery. Drop-outs with durations less than 2 minutes will not be registered by the software. Drop-outs greater than 2 minutes will shut the machine down.

Internal Battery:

The internal battery provides initial power to the unit to run the methanometer, auxiliary sensors and status displays prior to starting the machine. Battery power is also used to activate the compressed air solenoid that allows the starter circuit to operate. The battery also provides protection against momentary alternator drop-outs.

Battery Type:	Sealed 'Gel' type Lead Acid
Life:	Up to 5 years
Charge cycle:	Two stage, hardware/software controlled.
Maximum charge current:	Limited to 420mA max
Outgassing Relief:	Battery pressure valve and sintered vent on enclosure
Standby Life:	3 weeks before recharge required (4-6 months on Battery cut off version. Designated by cut outs in terminal PCB)
Charge time to first use from flat battery:	3 hours min for 5 re-starts following 3 weeks standby

Output Supplies:

There are three main power supply outputs from the unit. These are to power the methanometer, status display unit and solenoid. All three outputs are certified 'ia'

<u>Methanometer Supply:</u>	10.8V max at full load (input supply active or full battery)
	8.5V min at full load (input supply off, battery in empty state)
	12.0V max, no load
	Uo 16.2V max.
	Io 2.51A max.
	Lo/Ro 45

Status indicator Supply:

10.8V max at full load

8.5V min at full load

12.0V max , no load

Uo 16.2V max

Io 2.51A max

Lo/Ro 45

Solenoid Supply:

18.0V max holding solenoid.

Uo 29.85V max

Io 116.4mA max

Lo/Ro 537

Sensor inputs:

The unit is fed by a number of sensors whose function is to monitor the machines status.

Temperature:**No of Inputs:**

Three (3)

Type:

RTD 100 Ohm at 0°C

Scaling:

0 to 200°C

Excitation current:

1.0mA

Resolution:

1.0°C

Accuracy:

± 3.0°C

Fault modes:

Open sensor up-scale

Shorted sensor down-scale

Oil Pressure:**Type:**

Digital. 0V to 16.5V max

Range:

Application specific.

Gas Detection:**Type:**

Catalytic Methane 0 to 5% V/V

3 wire 4-20mA signal return

Digital Input levels:

Ui 16.5V max.

High level 3.0V min

Low level 0.5V max

Analogue Input levels:

Ui 16.5Vmax.

Max scaled current 25mA

Min scaled current 0mA

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Data Communications: (advanced units only)

Type:	2.4GHz Wireless link using proprietary protocol with option to use ZigBee protocol stack.
Connection:	Antenna fed from internal radio section to exterior via 16/20mm gland.
Range:	Up to 50m line of sight.
Communication functions:	Download of logged data and setup. Upload of configuration settings.

Mechanical Details:

Enclosure Rating:	IP66
Material:	Stainless Steel 316 (1.6mm)
Finish:	Polished
Dimensions:	W 300mm, D 200mm, H 80mm
Mounting:	End flange. 4 x M8 holes
Protection Concept:	Encapsulated to 'm' standard.
Labelling:	Operational and certification parameters.
Weight:	10 kg approx.

Connections:

Type:	16/20mm cable glands with armour retention. Connections made via barrier screw terminals.
No of glands:	Nine (9)

Environmental:

Shock:	1000 shocks 40g, 3 planes
Vibration:	
Low Frequency:	0.25mm ppk sinusoidal 10Hz to 100Hz, 3 planes
Medium Frequency:	2g ppk sinusoidal 10Hz to 600Hz, 3 planes
EMC:	Compliant with required standards

SECTION 2 - INSTALLATION

2.1 Installation Guidelines

The Dieselguard Diesel Machine Monitor can be mounted in any orientation without affecting its operation. Since the unit does not require routine servicing, it can be mounted in a position that is not normally accessible. The lid of the enclosure must be fitted correctly with the Dubbo seals and M6 stainless steel button head screws tightened to at least 0.1Nm. This is required to comply with the certification and IP rating.

Space should be allowed to ensure the lid is fitted correctly and the screws are torqued as required.

Power connections:

***** SAFETY NOTE *****

The controller has an earth stud that must be infallibly connected to the chassis of the vehicle to comply with the certification requirements.

The unit has a type 2S power input cable up to 6m long which has to be terminated in a suitable Exd or Exe enclosure to pick up the alternator supply. The installer would normally add this into the hours run enclosure, but if all the gland holes are already allocated, a separate enclosure may be required.

Cable markings for the type 2S input cable are: 1,2,3 nominally 0V, 4 nominally +ve. The system is not polarity sensitive and so if the connections are reversed it is not a problem. These markings are present for variants with a non-isolated 0V referenced input supply.

2.2 It is a condition of safe use that:

** The apparatus must be installed such that the integral wires are terminated in a suitably certified Ex e or Ex d enclosure having a minimum Ingress Protection (IP) rating of IP55. If the wires are terminated in an Ex e enclosure suitably certified Ex e terminals must be used for terminating the wires.*

** The apparatus is not suitable for use in areas with acetic acid gases, mists, vapours or liquids are present.*

** The unit is infallibly connected via the earth stud to the chassis of the vehicle.*

2.3 Signal Connections

All of the connections to the Diesel Machine Monitor are IS circuits and should be wired accordingly. In some locations it may be necessary to protect IS cables from mechanical damage. The unit is not supplied with interconnecting cables; the installer is responsible for providing cabling to suit the application. Please refer to table 2 in the products test report for details on permitted cable groupings.

To operate the Dieselguard Diesel Machine Monitor it requires a momentary switch input. The installer would normally fit a push button in a suitable location. This is an IS circuit and the switch is considered simple apparatus. Some machines have a two stage safety pressure loop and this function could also be derived from a pressure switch mounted in the primary pressure circuit.

The monitor has a deputy override input which if required the installer would mount a suitable lockable switch. This is an IS circuit as above. If the unit is used in a manual reset mode the keyswitch can also be used to reset the system.

Take care during installation not to damage the hydrophobic barrier on the battery compartment breather vent as the IP rating of the enclosure will be impaired.

2.5 Gasguard Transmitter / Sensor. 65-6551-CH4

The Gasguard transmitter may include an integral or remote head sensor pictured below.

In either case the sensor should be mounted pointing vertically downwards and sufficient space left around and beneath the sensor for fitting of the calibration cup.

The front panel of the transmitter has to be accessible for calibration and service of the sensor and should be mounted in a position to allow for the magnetic screwdrivers to be used and the reading on the screen viewed.

It is not necessary for the transmitter to be viewed by the driver.

If the remote head sensor is used bear in mind that if the sensor to be replaced, easy removal in installation of the cable is an advantage.

See Gasguard sensor manual for further information. Part NoE08975



2.6 IDA Display E09232

The IDA display is optional and alternative display panels using LED and other equipment can be used.

If the IDA display is used it should be mounted in a position where the driver can see it without it being in his direct line of vision. See IDA data sheet GSB006 for more detail.



2.7 IS Solenoid Valve WPISB314

The IS Solenoid Valve can be mounted in any suitable location. It is supplied with a weatherproof enclosure which has two M4 x 8 mm mounting holes in the base. The pneumatic connections are:

Ports 1 and 2 are normally connected when the solenoid is energised. Ports 1 to 3 (the vent port) are connected when the valve is de-energised. The valve should be connected so that the pressure is released from the downstream side of the valve when de energised.

See manufacturer's installation and maintenance sheet for additional information.



2.8 Cable Systems

The external connections to the Dieselguard Diesel Machine Monitor, apart from the power connection mentioned above are Intrinsically Safe Circuits and as such should be installed to comply with the requirements of AS 2381.7 or the applicable mine standard.

As such normal IS cables can be used although extra protection from mechanical damage may be required in non enclosed areas or adjacent to rotating or moving components.

2.9 Wireless Communications Antenna

For units fitted with a wireless communications link, it will be necessary to mount the small whip antenna to the vehicle. The antenna is located at the end of the free coax cable and is protected by a rugged sheath. When mounting the antenna, consideration should be given to keeping the actual receiving part (the last 200mm of the cable assembly) away from the metalwork of the vehicle. If the antenna is too close to the vehicle, then the useable range may be reduced. Ideally, the antenna should be mounted vertically.

SECTION 3 - OPERATION:

3.1 Introduction

The system is designed for simple operation, compromising of a “start” switch input which energises the Gas detection system for two minutes from its own back up battery. During the two minute period normal starting procedures can be followed, if the gas level is acceptable after a 20 second test.

The Dieselguard Machine Monitor is a blind control unit that can be mounted in any convenient position. The Gas sensor (Gasguard) would normally be mounted near the front of the vehicle adjacent to the air filter intake and a robust 3 digit display (IDA) or LED status panel indicates the status of the system for the driver.

3.2 Start Sequence

The IDA display is activated when the “start” contact operates. The display flashes green for 20 seconds to allow the gas sensor to stabilise. Following this 20 second period, the display shows a continuous display and will indicate the gas level measured.

3.3 First Level alarm

If the display level is below 1% by volume CH₄, the display will be **Green**. For gas readings between 1% by volume and 1.25% by volume, the display will be **Orange**. Since these gas levels are below the “shutdown” level, normal starting procedures can be followed.

Once the machine is started the alternator charges the battery of the Dieselguard unit. Apart from on some of the early versions the display will flicker to indicate the charge is being received. There are two level of charge rate, high level for when the battery is low, which flickers Red and trickle charge that keeps the battery topped up which flickers Amber.

3.4 Second Level Alarm

If the gas level rises above 1.25% by volume, the display will turn **Red**. Under this condition, the solenoid will not be energised, the machine can not start and the monitoring system will shut down after 2 minutes. For operation in auto-reset mode, if during the 2 minute monitoring period, the gas level falls below the “Shutdown” point, the engine can be started. In

the manual reset mode an external switch must reset the “shutdown” alarm before the machine can be started. The display will flash **Amber** if the system has been tripped and is waiting for a reset.

3.5 System Shutdown

The system remains in operation while the engine is running. If the gas level exceeds the shutdown level the solenoid de-energises hence de-pressurise the control circuit and closing the fuel supply line. Once the engine stops the Gas detection system operates for about 1 minute 40 seconds before going to sleep.

3.6 Deputy Override

A deputy override switch input is provided so that the vehicle can be moved under supervision in an emergency. This switch could also be used for the reset function.

3.7 Cold Start Function

In regular use the Dieselguard Diesel Machine Monitor’s battery will keep the system ready for operation. After periods of non use, the battery drain in standby mode may mean that eventually the unit will not have sufficient power to start the system. Typically the Diesel Machine Monitor can typically be left for 10 to 11 days before a bypass or “cold start” is required.

Later versions of the Dieselguard have an internal battery disconnect ability when not in use. These units are identified by scooped edges of the internal terminal connection board. The batteries of these units will hold the charge for many months (typically 6 months) without further charging being required.

Lockable bypass ball valves on the solenoid valve can be used to override the gas system. When the valves are used the vehicle can be started without the use of the detection system.

Depending on the valve configuration, as soon as the vehicle has started in the bypass mode the gas system can be energised and when a stable indication is shown the valves can be reset. The alternator charges the battery and within 20 - 30 minutes normal function of the system is possible.

If the vehicle is started and the valves are reset and then the engine is not run for sufficient time the battery may not pass its minimum

voltage requirement to operate the system. The Diesel Machine Monitor has a battery saver cut off voltage and the monitor will not operate from the battery until the minimum charge has brought the battery voltage above that level.

In this case the Diesel Machine Monitor may not complete its 2 minute run and may shut down shortly after the machine engine is stopped. It would be necessary to re-start the machine in bypass mode and run it for a longer period.

Consideration should be given to the storage of the unit. If the unit remains in storage for a length of time prior to installation, a re-charge will be required before it can be used. The unit can be charged directly by connecting a 12-30V supply directly to the type 2S power lead. It is therefore recommended that the unit is re-charged on a supply prior to installation. The required re-charge time is around 12 hours from a completely discharged battery.

A battery charger can not be used for this function because of the resistance of the Dieselguard's internal circuit.

SECTION 4 - MAINTENANCE

The Dieselguard Diesel Machine Monitor has few maintenance requirements. The unit is basically an exchange item as all the internal electronics are encapsulated and non serviceable.

4.1 Visual Inspection

It is recommended that periodic visual inspection of the unit is performed to confirm the integrity of the enclosure, cable glands and labels.

4.2 Close Inspection

A check should be made for the correct screw tightness and that the lid is sealed correctly. The integrity of the seal is dependant on the lid screws being tightened to the correct torque.

4.3 Hydrophobic Barrier

The enclosure breather is fitted with a hydrophobic barrier and this should be inspected to ensure it is not damaged. This barrier is essential to the IP rating of the enclosure and must be intact to maintain a rating of IP66

4.4 System Check Procedure

We recommend the user develops a site procedure for checking the operation of the installed system. The inspection regime will most likely be dictated by the associated equipment used with the Dieselguard Machine Monitor, such as the gas transmitters. The manuals for these products will provide information on the requirements.

4.5 Calibration

When the analogue output of the Dieselguard Diesel Machine Monitor is used with an indicator we recommend that part of the routine checking of the installation involve comparing the calibration reading on the gas transmitter with the display.

4.6 Changing the Internal Battery

After a period of use, the internal battery will need to be replaced. The length of time before this becomes necessary will vary depending on charge/usage cycle, but will be typically 3 to 5 years.

Because the construction of the battery housing forms part of the products' certification, this operation must be done by the manufacturer. This will entail removing the unit from the vehicle and returning it to Ampcontrol. Because of the infrequency of replacing the battery, this could be done as part of a vehicle routine major service.

Section 5 – Equipment List

E09464	Dieselguard Controller Basic
E09481	Dieselguard Base Station RF Receiver
E09484	Dieselguard Controller Radio Version
E09819	Dieselguard User Manual
E09232	IDA display
E09421	Gas Detector Calibration kit
65-6551-CH4	Methane Gas Transmitter / Sensor c/w Display
65-6551-CH4-R05	Methane Gas Transmitter / Sensor c/w Remote Head on a 5m lead and Display
61-6551-CH4-R10	Methane Gas Transmitter / Sensor c/w remote head on a 10m lead and Display
WPISB314	Asco 3/2 solenoid valve

SECTION 6 – FAULT FINDING

The following fault finding tables are provided as an indication of the possible faults, the symptoms and solutions associated with the Dieselguard System. Refer to Table 1 for faults associated with the entire Dieselguard System and to Table 2 for faults specifically associated with the Gasguard Sensor.

Table 1 – Dieselguard System Fault Finding		
Symptom	Cause	Solution
Display system does not illuminate when the 'run' button is pressed	Internal battery below minimum charge level	Put machine In bypass and charge battery from alternator. Disconnect the power supply cable from the machines electrical system and charge by connecting a 12Volt Power Supply to the Dieselguard Supply leads (Core 4 positive and Cores 1,2 & 3 negative) (Note. Do not use a Battery Charger.) (See section 1.5 for recommended charge time)
	Run button disconnected or broken	Repair connection or replace button Check connections for the Run Button in the Dieselguard Control Unit
	IDA Display system fault	Check the voltage between the IDA 0V and V+ terminals on Term 1 (should be approx 12V). Check the voltage between the IDA 0V terminal on Term 1 and the IDA Green terminal on Term 3. Check the voltage between the IDA 0V terminal on Term 1 and the IDA Red terminal on Term 3. Note: There must be approximately 12V from the IDA 0V and V+ terminals on Term 1 AND either 12V at the Green or Red terminals on Term3 for the IDA to indicate. If the Gas Sensor indicates a gas level and the IDA does not either the battery voltage is low or there is an Internal Fault (refer below).
	Internal fault	Call manufacturer
Display system does not flash green when the 'run' button is activated or assumes one of the following states after the initial 20 second sequence.		
1. Steady Green	Input power present prior to start sequence. Unit shut down prematurely when last used due to low battery.	Normal start up does not expect input power. Allow unit to shut down normally (2 min) and restart. If unit has not been charged it may be necessary to Bypass and charge the system first.
2. Steady Amber	Ambient gas level above first alarm point	Check ambient gas levels and report.
3. Steady Red	Ambient gas level above second alarm point Allow control unit to shut down. Re-start unit	Follow site procedure to leave area until deemed safe.
4. Flashing Amber	System has sensed gas above second alarm	Check ambient gas level and operate reset button
Unit powers down before start sequence completes	Internal battery below minimum charge level	Put machine In bypass and charge battery from alternator or Disconnect the power supply cable from the machines electrical system and charge by connecting a 12Volt Power Supply to the Dieselguard Supply leads (Core 4 positive and Cores 1,2 & 3 negative) (Note. Do not use a Battery Charger.)

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Symptom	Cause	Solution
Solenoid does not energise after the 20 second start sequence	Ambient gas level is or has been above second alarm point	Follow plant procedure to leave area until deemed safe
	Solenoid disconnected or defective	<p>Check the voltage between the SOL 0V and V+ terminals on Term 1 (should be approx 16V for an instant when the Solenoid should be closing and approx 12V after that).</p> <p>Repeat the above tests at the terminals of the solenoid.</p> <p>If the supply to the solenoid is correct, repair the connection or replace the solenoid as required.</p>
	Internal Fault	Consult factory
IDA Display Indicates 3 dashes (- - -)	No signal to IDA Display	<p>Check the sensor to see if it is in fault (refer to the Gasguard Sensor Fault Finding Table on Page 5).</p> <p>If the sensor is operating correctly disconnect the wire from the "4 – 20mA In terminal" on Term 5 and connect a milliamp meter between the disconnected wire and the terminal (there should be approximately 4mA indicated on the milliamp meter if the sensor is in clean air). Apply 2.5% Span Gas to the sensor (when the sensor reading displays 2.5% there should be approximately 12mA indicated on the milliamp meter) (For terminal details see section 1.4.1)</p> <p>If there is the correct output from the sensor as detailed above disconnect the wire from the IDA signal terminal and connect the 4 – 20mA In wire and the IDA Signal wire to the 4 – 20mA In terminal on Term 5 (The IDA should indicate approximately the same as the gas level indicated on the Gasguard Sensor display).</p> <p>Or</p> <p>Connect a Loop Calibrator between the OV Terminal in the IDA and the 4-20mA input signal terminal. Input a 4mA signal (should read 0%) and then input a 20mA signal (should read 5%)</p> <p>If there is a correct reading on the IDA in either of the above tests there is an internal fault in the Dieselguard. If the second test fails the input fuse on the IDA may have been blown and the IDA should be replaced.</p>
Battery Charging indication is indicated on the IDA by a quick red pulse for full charge rate or amber pulse on trickle charge when alternator is operating		
Battery not charging	Input power connection faulty	Repair connection
	Faulty alternator	Replace alternator
	Internal battery faulty	Replace internal battery (factory re-fit)
	Internal Fault	Consult factory

Table 2 – Gasguard Sensor/Transmitter Fault Finding		
Symptom	Cause	Solution
The display indicates PU	The Gasguard Sensor is powering up.	This is not a fault, it is an indication that the unit has only just had power applied and is powering up. (Output is held at 4mA)
The display indicates CAL or flashes	Calibration mode initiated (display blinks when in calibration mode)	This is not a fault, if Calibration mode is not required place the magnetic tip of the calibration pen over the CAL symbol for 5 seconds until the display flashes SAV
The display indicates SAV	Calibration settings have been saved	This is not a fault.
The display indicates 777	There is no sensor plugged into the amplifier	Check the electrical connections between the sensor and the amplifier PCB in the Sensor/Transmitter. Note: The Sensor/Transmitter also indicates 777 when the supplied voltage is low i.e. the Dieselguard's internal battery voltage is low.
The display indicates 888	Sensor is faulty	Return the Sensor/Transmitter to Ampcontrol for repair
The display indicates 999	Amplifier needs reconfiguration	Return the Sensor/Transmitter to Ampcontrol for repair
The display indicates ERR	If this code appears during the span calibration of the sensor	The code indicates that the output of the sensor is insufficient and the sensor will need to be returned to Ampcontrol for repair. Several things should be checked before changing the sensor. 1. Check the calibration gas. It should be a 2.5% CH ₄ in air mixture although other trace gases may be present. Lower gas mixtures like 2% will reduce the output leading to premature change out of the sensor. 2. Check the gas flow to ensure it is within the required range of 0.5 to 1.0 l/m. 3. Check the surrounding air flow. If the ambient air flow is above 1.5 l/m it can dilute the calibration gas. Using the Gassing ring E09385 allows calibration in all conditions. 4. Check the sensor is not blocked with dust or mud. The sensor can be washed out and calibration carried out after a short drying out period. 5. If all the above are ok and confirmation of output is required the sensor output can be measured with a DVM. The voltage dropped across the sensor can be measure at zero and 2.5% CH ₄ . A DVM set to DC mV can measure these voltages on the RH and adjacent upper terminal block on the rear left hand side of the amplifier PCB.
	If this code appears during the zero calibration of the sensor	The Zero Balance of the sensor is outside the preset limit and the Sensor/Transmitter will need to be returned to Ampcontrol for repair. Check the surrounding air is not effecting the zero calibration as per 3 above.
No 4 – 20 A Output	Supply voltage is low or incorrect polarity	Check that voltage applied to the Amplifier PCB is 12VDC and that polarity is correct.
	Loose plug and terminal connections	Check connections and repair as required
	If all of the above are correct the Sensor/Transmitter will need to be returned to Ampcontrol for repair.	

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Symptom	Cause	Solution
The Sensor/Transmitter cannot be Spanned or Zeroed. (During Cal gas level increases and then drops back.)	Supply voltage is low or incorrect polarity	Check that voltage applied to the Amplifier PCB is 12VDC and that polarity is correct. (Dieselguard may need charging.)
	Loose plug and terminal connections	Check connections and repair as required
	If all of the above are correct the Sensor/Transmitter will need to be returned to Ampcontrol for repair.	
Erratic Output	Loose plug and terminal connections	Check screw connections at PCB, Fit anti vibration clip E10051 if required.
	Supply voltage is low or incorrect polarity	Check that voltage applied to the Amplifier PCB is 12VDC and that polarity is correct.
	Severe supply voltage swings	Intermittent fault in the connections to and from the Dieselguard.
	If all of the above are correct the Sensor/Transmitter will need to be returned to Ampcontrol for repair.	

SECTION 8 - APPLICATION NOTES

Note 1:

If Dieselguard is connected to Mining Repairs Flameproof Alternator (Part Number MR110) with DCBR module, ensure the MR110 alternator firmware is Version 1.88 or higher. Failure to comply may cause operational difficulties resulting in an alternator overload trip at low revolutions.

SECTION7 - CERTIFICATION DOCUMENTATION



Certificate of Conformity Addendum

Certificate No.: ANZEx 05.4010X	Issue No.: 2	Date of Issue: 12 May 2006
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Certificate Holder: Ampcontrol Pty Ltd.
250 Macquarie Road
Warners Bay, New South Wales 2282



Electrical Apparatus: Dieselguard Diesel Machine Gas Monitor Types E09464, E09465, E09481, E09484, E09485, E09482, E09483, E09486 and E09487

Type of Protection: Ex m, [ia]

Marking Code: Ex m, [ia] I (150°C) IP66 $T_{amb} = -20^{\circ}\text{C}$ to $+70^{\circ}\text{C}$,

Manufacturing Location(s): AUSTECH INSTRUMENTS Pty Ltd
8 Ponderosa Parade
Warriewood, New South Wales 2102

*The EPEE certification database located at www.sai-global.com shows the validity of this Certificate.
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 ABN 06 098 886 563	Certificate issued by ITACS Pty. Ltd. 4-6 Second Street SA 5007 Australia PO Box 300 Hindmarsh SA 5007 Australia Phone: +61 8 8346 8680 Fax: +61 8 8346 7072 Email: itacs@itacslab.com	 Accreditation by the Joint Accreditation System of Australia and New Zealand Acc No. Z2870404AA
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Certificate of Conformity Addendum

Certificate No.: ANZEx 05.4010X	Issue No.: 2	Date of Issue: 12 May 2006
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*This Certificate Addendum supplements the Original Issue of this Certificate, (Issue 0) and is granted subject to the conditions as set out in Standards Australia/Standards New Zealand Miscellaneous Publication **MP87**.*

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

AS/NZS 60079.0 :2000	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
AS/NZS 60079.11:2000 inc A1	Electrical apparatus for explosive gas atmospheres - Part 11: Intrinsic safety i
AS2431-1981	Electrical equipment for explosive atmospheres - Encapsulated apparatus- Type of protection m

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

The equipment listed has successfully met the examination and test requirements as recorded in

Original Test Report No. and Issuing Body:	TR3177 - ITACS
Test Report Covering this Addendum	TR 3743 - ITACS
Quality Assessment Report No. and Issuing Body, supporting this Addendum:	ANZEx 05.4010X 06-01 ITACS
File Reference:	ANZ Ex 05.4010X

Signed for and on behalf of issuing body

General Manager
Position

12 May 2006

Date of Issue

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This certificate is not transferable and remains the property of the issuing body
and must be returned in the event of it being revoked or not renewed.

Australian/New Zealand Certification Scheme for

EXPLOSION-PROTECTED ELECTRICAL EQUIPMENT

ANZEx Scheme

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Variation covered by this Addendum

EQUIPMENT VARIATIONS:

Changes covered by this by Addendum include the following:

1. Minor electrical changes and minor mechanical changes to the main and wireless printed wiring boards.
2. Replacement of the internal battery by an integral cable. Models incorporating this change are:

Dieselguard Diesel Machine Gas Monitor Model E09464EB.
Dieselguard Diesel Machine Gas Monitor Model E09465EB.
Dieselguard Diesel Machine Gas Monitor Model E09481EB.
Dieselguard Diesel Machine Gas Monitor Model E09482EB.
Dieselguard Diesel Machine Gas Monitor Model E09483EB.
Dieselguard Diesel Machine Gas Monitor Model E09484EB.
Dieselguard Diesel Machine Gas Monitor Model E09485EB.
Dieselguard Diesel Machine Gas Monitor Model E09486EB.
Dieselguard Diesel Machine Gas Monitor Model E09487EB.

Please refer to the previous Issues of this Certificate, Issue 0, and Issue 1 for full product details

MANUFACTURER'S DOCUMENTS

Manufacturer's Documents associated with Issue 2 of this Certificate include those listed below. Refer to Issue 0 and 1 of this Certificate for the full range of manufacturers Documents.:

Document No.	Document Title	Issue	Date (yyyy/mm/dd)
24-2660-BT	Diesel Machine Monitor Main System PCB Bottom Layer	D	2006/02/03
24-2660-M1	Diesel Machine Monitor Main System PCB Mid Layer 1	D	2006/02/03

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ANZEx Scheme

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Document No.	Document Title	Issue	Date (yyyy/mm/dd)
24-2660-M2	Diesel Machine Monitor Main System PCB Mid Layer 2	D	2006/02/03
24-2660-TO	Diesel Machine Monitor Main System PCB Top Overlay	D	2006/02/03
24-2660-TT	Diesel Machine Monitor Main System PCB Top Trace	D	2006/02/03
24-2663-BT	Wireless Link PCB Bottom Trace	D	2006/02/03
24-2663-TO	Wireless Link PCB Top Overlay	D	2006/02/03
24-2663-TT	Wireless Link PCB Top Trace	D	2006/02/03
25-6600ASSY	Enclosure, lid & accessories diesel gas sampler general assembly	3	2006/03/01
28-6601LEB	Label certification 9464eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6603LEB	Label certification 9465eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6604LEB	Label certification 9481eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6605LEB	Label certification 9482eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6606LEB	Label certification 9483eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6607LEB	Label certification 9484eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6608LEB	Label certification 9485eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6609LEB	Label certification 9486eb diesel gas sampler with external battery manufacturing details	0	2006/01/31
28-6610LEB	Label certification 9487eb diesel gas sampler with external battery manufacturing details	0	2006/01/31

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Document No.	Document Title	Issue	Date (yyyy/mm/dd)
47-6601L-01	Antenna co-axial monopole assembly with fittings general arrangement	2	2006/02/02
72-6600GAEB	Main components diesel gas sampler with external battery general arrangement	0	2006/03/01
72-6600GA	Main components diesel gas sampler general arrangement	3	2006/03/01
72-6600 Sheet 2 of 11	Battery Charging Circuits	V1C	2006/02/01
72-6600 Sheet 3 of 11	Power Switching and Supply Monitor	V1C	2006/02/01
72-6600 Sheet 4 of 11	ia Output Supplies	V1C	2006/02/01
72-6600 Sheet 5 of 11	Processor and User I/O	V1C	2006/02/01
72-6600 Sheet 6 of 11	Main Signal I/O	V1C	2006/02/01
72-6600 Sheet 7 of 11	Radio Data Link Version 2	V1E	2006/02/01
72-6600 Sheet 8 of 11	Root Schematic + connectors	V1C	2006/02/01
72-6600 Sheet 11 of 11	Diesel Machine Monitor Certified Parts List	C	2006/03/06
75-2660ENCEB	Main components diesel gas sampler with external battery epoxy resin encapsulation	0	2006/03/01

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Document No.	Document Title	Issue	Date (yyyy/mm/dd)
75-2660ENC	Main components diesel gas sampler epoxy resin encapsulation	2	2006/03/01

CONDITIONS OF CERTIFICATION:

Conditions of manufacture

Conditions of manufacturer are;

1. The apparatus must be manufactured in accordance with the certified drawings.
2. The apparatus shall be subjected to a 1000 V r.m.s test voltage applied between input terminals and case for not less than 1 minute.

Conditions of safe use

1. The following parameters are not exceeded

Input Parameters

Integral Cable	
U_m	90 V
U_n	12 to 24 V
Programming Header	
U_m	16.2 V
External Battery	
U_m	16.2 V

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Output Parameters

Terminal ID	U_o (V)	I_o (mA)	P_o (mW)	C_o (μ F)	L_o (μ H)	L/R (μ H/ Ω)
T.B.1 pin 1 wrt 0V e.g. pin 2	16.2	2508	3929	10	10	45
T.B.1 pin 3 wrt 0V e.g. pin 4	16.2	2508	3929	10	10	45
T.B.1 pin 5 wrt 0V e.g. pin 6	29.9	116.4	869	1	10	537
T.B.2	16.2	49.2	201	10	10	2347
T.B.3	16.2	216.1	870	10	10	536
T.B.4	16.2	101.8	411.9	10	10	1133
T.B.5	16.2	1218.8	1710.6	10	10	94
Antenna	16.2	2508	5760	10	10	45
Programming Header Pin 1 wrt pin 6	16.2	1715	3014	Not applicable see note 5 below		
Programming Header Pin 2 wrt pin 6	16.2	1715	3014	Not applicable see note 5 below		
Programming Header Pin 3 wrt pin 6	16.2	1715	3014	Not applicable see note 5 below		
Programming Header Pin 4 wrt pin 6	16.2	1715	3014	Not applicable see note 5 below		
Programming Header Pin 5 wrt pin 6	16.2	1715	3014	Not applicable see note 5 below		

- The apparatus must be installed such that the integral wires are housed in a suitably certified Ex e or Ex d enclosure having a minimum Ingress Protection (IP) rating of IP55. If the wires are terminated in an Ex e enclosure suitably certified Ex e terminals must be used for terminating the wires.

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3. The earth bonding conductor must be infallibly connected to the chassis earth via terminations that are fixed in their mountings without possibility of self-loosening and shall be constructed such that the conductors cannot slip out of their intended location.
4. The apparatus is not suitable for use in areas where the equipment may be subject to corrosion, eg areas where acetic acid gases, mists, vapours or liquids are present
5. Connections to the Programming port are **only** to be used in the non-hazardous area.

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